FEBRUARY 1973

MODEL ROCKETEER

OFFICIAL JOURNAL OF THE NATIONAL ASSOCIATION OF ROCKETRY

Vol. XV No.1

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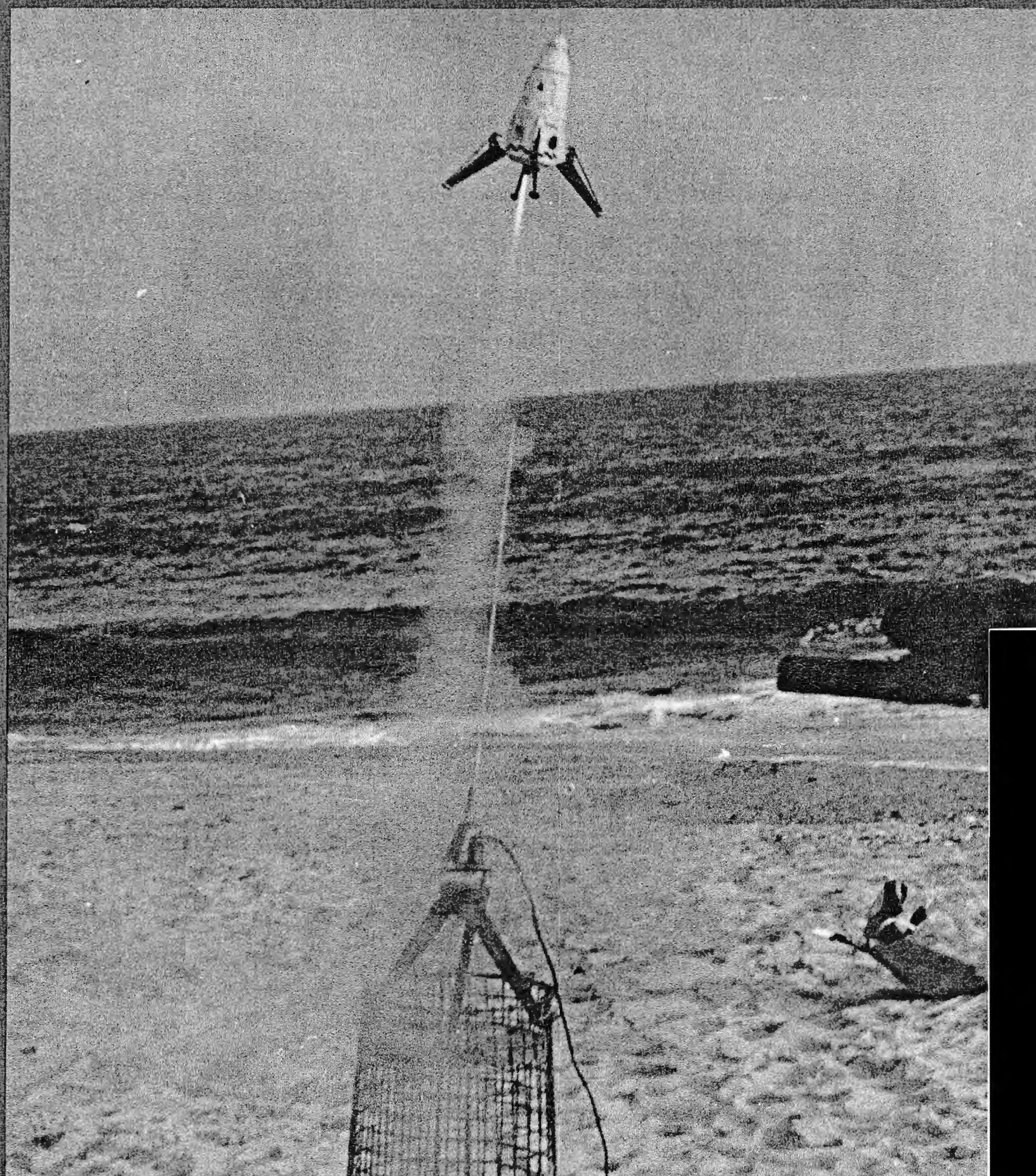

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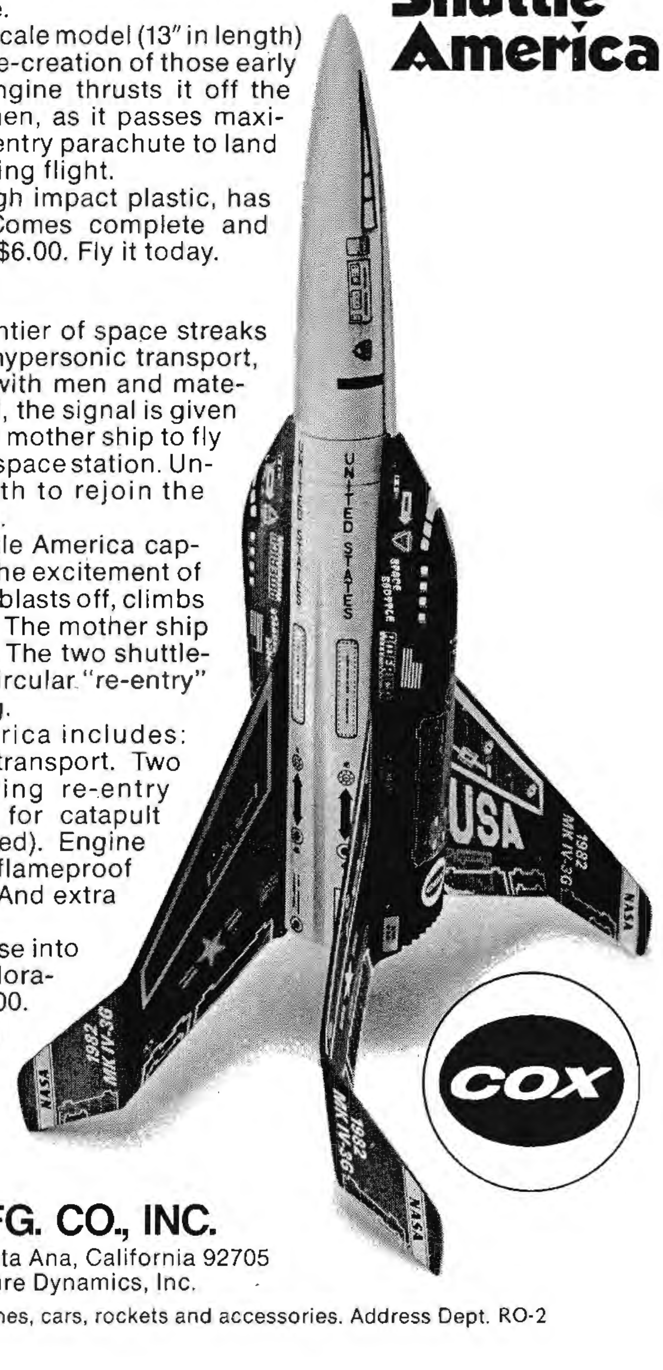

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CONTENTS

COVER PHOTO
Don't we all sometimes wish we had a launch site like this one? A Mars Lander takes off during a routine launch on the beach in Long Beach, New York. (Photo by Bruce Zinn, developing and printing by Robert Szymanowicz)

EDITOR'S NOOK

We'd like to remind our readers who are having subscription problems or are changing their addresses to write to NAR Headquarters, not the Editorial Office. This will speed up the answer.

Our "NAR in Action" Editor since the *Model Rocketeer* assumed its present form, Bob Mullane, is unable to continue with us. Our new editor is Ron Wright of Riverside, California. Ron is a member of the Riverside Rocket Center. We want to encourage people who have "Soapbox" articles and ideas for "NAR in Action" articles to write to Ron. He is interested in gripes, questions about the NAR, etc. Thanks, Bob, and good luck, Ron.

Since this is the first issue of *Model Rocketeer*'s second year as an independent magazine, we'd like to make a few comments. We've gotten ideas, comments, suggestions, photographs, articles, and help from over 100 people in the United States and Canada, and we want to thank all of them. We're getting more and more material in, and the quality is improving. Paul Conner informs us that he has quite a few plans lined up, and Pat Stakem has a stack of technical articles. This doesn't mean that we don't need more, of course, but it does say that the people who told us we'd never find the copy to fill a sixteen-page magazine every month were wrong. We've also seen that those people who said that the NAR wouldn't be around by this time were wrong, too. The number of letters, articles, and plans we're getting is on the increase, and we've got so many "Soapbox" articles that we don't know when we'll ever get them all in. This seems to indicate that although our membership is smaller than it was some time ago, it is more concerned than it was at this time last year. Our members are willing to examine the problems of our organization and tackle them, and that makes us hopeful about the NAR's future.

To all our rocket glider fans, happy Groundhog Day.

Elaine

—Elaine Sadowski

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NAR IN ACTION

SECTION PECKING ORDER

by Bob Atwood
NAR Director of Section Activities

Based on data of my own, Dick Sipes' section numbering system, and Jim Barrowman's printouts, I have been able by dint of much detective work to pull together a section pecking order which is listed below and also shown in graphical form. If you note any errors, please advise me. It is requested that sections in the seventh year or better category send me the earliest date from which they have been chartered continuously so we can honor the club with the longest continuous NAR service.

We can be proud of 1972, when NAR membership was off heavily, to be able to say that we almost held our own in number of sections. We are doing better in holding sections, also. Not long ago, we lost half our sections each year at renewal time!

Sections, communicate with your NAR Regional Managers; submit a name to them for your 1973 section liaison officer if you haven't already done so, and arrange for your annual visitation by your Regional Manager.

NAR section pecking order by years—the position within a year only has significance in the first, second, and third years of continuous service (Pascack Valley in '67 and Arevalos in '68 lost out as they each had an unchartered year. Don't let your section get caught in this kind of a bind, without NAR insurance and NAR competition status.):

7th year or better:

102 Annapolis Association of Rocketry
109 Birch Lane Rocket Section
110 Black Hawk Section
115 Fairchester
139 NARHAMS
142 North Shore Section
156 Star Spangled Banner
157 Steel City Section
166 New Canaan YMCA Space Pioneers
167 Zenith Section

6th year:

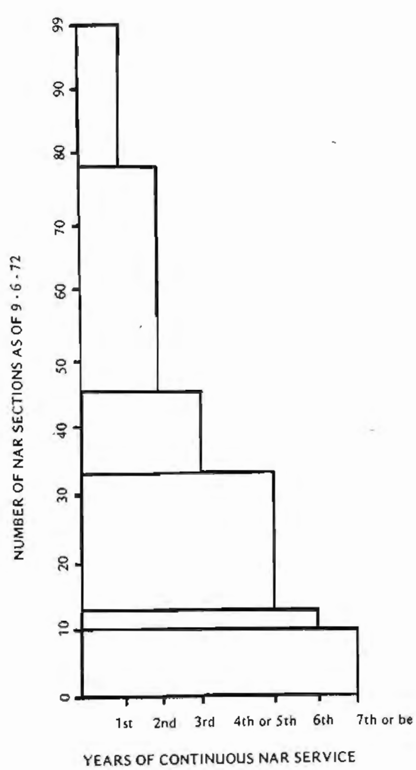
133 Missile Minders
134 M.I.T. Model Rocket Society
146 Randallstown Rocket Society

4th or 5th year:

103 Apollo/NASA
104 Arvelos Rocket Association
106 Belair Association of Model Rocketry
108 Bethlehem Section
113 Columbus Society for the Advancement of Rocketry
114 Tri-City Cosmotarians
116 Gemini Model Rocket Society
117 Glen Ellyn Rocket Society
130 Metropolitan Area Rocket Society (M.A.R.S.)
136 Monroe Astronautical Rocket Society
138 NAR Capitol Area Section (NARCAS)
143 Pascack Valley
153 SMARS
154 Southland Association of Rocketry
162 Titans
163 Wheaton Rocket Association
165 Brooklyn Rocket Society
168 Midwest Rocket Research Association
169 Technological Institute for Rocket Observation and Study (T.I.R.O.S.)
176 South Seattle Rocket Society
178 Hawkeye Section of NAR

3rd year:

179 Outa-Sight
180 North Royalton Rocket Society
187 Los Alamitos-Rossmoor Section
202 Central New England Rocketry Assn.
203 The Vikings Rocketry Society
204 Southern Maryland Area Rocket Team (SMART)
205 No. Virginia Association of Rocketry
206 Sulphur River Section
217 Broward County Model Rocketry Assn.
221 Upper Arlington Rocket Club
224 Keystone Model Rocket Society



2nd year:

228 Dayton Rocket Research
229 San Gabriel Valley Model Rocket Society
233 Wolverine Rocketeers of Detroit
234 Apollo 13 Rocketry Club of the Eastern Union County YMHA
235 Memphis University School Model Rocket Society
236 New England Rocketry Federation
238 NAR Gateway Arch Section
240 Evanston Model Rocketry Association
242 Mickey Mouse Section
245 Stacey Rocketry Club
248 Harford Area Space Modelers (HASM)
251 Turk's Head Organization of Rocketry
253 Imperial Valley Model Rocket Assn.
254 Elwood Association of Rockety
255 Air Force Academy (AFA)
256 Explorer Rocket Association
258 Phillipsburg Area Rocket Club (PARC)
262 Honeoye Falls Starblazers
264 The Viking Rocket Club
265 Fanwood Rocket Club
267 Kent Kondors
269 Cherry Hill Sq. CAP Rocketry Club
271 Simi Valley Section
272 Pueblo Association of Rocketry
273 Lancaster Area Rocket Club (LARC)
275 Goldsboro Starlancers
277 Riverside Rocket Center
278 Point Place Model Rocket Club of Toledo Ohio
279 Mile Square Section
280 Society of Lodi Area Rocketeers
281 Burlington County Rocket Society
282 Summit City Aerospace Modelers
283 Phoenix Model Rocket Society

1st year:

284 Ark-La-Tex Model Rocketry Club
285 Shawnee Rocket Association
286 Southeastern Pennsylvania Establishment for the Advancement of Rocketry
287 Atomic Model Rocket Society of Washington
288 Silver State Section
289 MONROCS
290 Star Rovers
291 Manhattan Association of Rocketry
292 Hagerstown Area Rocket Research Soc.
293 Lehigh Valley Section
294 Omega Model Rocket Society
295 South Ozone Park Association of Model Rocketry
296 St. Charles Aerospace Research Engineering (SCARE)
297 Sky Raiders Model Rocket Club
298 Mo-CAP Model Rocket Section
299 Tri-Valley Rocket Section
300 Trailside Model Rocket Club
301 Tustin Igniters
302 Honorocs Model Rocket Club Section of the NAR
303 Pearl River Vulture Squadron
304 Columbia Model Rocket Club of Washington

SECTION NEWS

by
Charles Gordon

LEAP-1

by Elisa C. Diller (SSB Section)

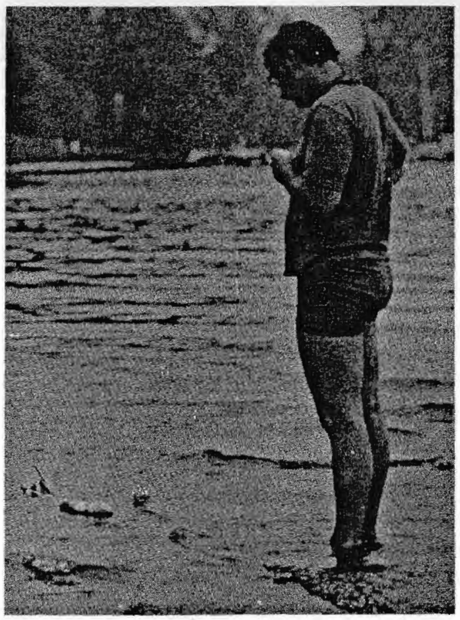
LEAP–1, the unsanctioned meet sponsored by the Star Spangled Banner Section (#156) was held on August 26, 1972, LEAP standing for LOOK, EGG ASTRONAUT PROJECT! consisted of only one event—Apollo Splashdown, which turned out to be a kind of unorthodox egglofting event with some parachute duration and spot landing thrown in for good measure.

The basic idea was as follows: successfully launch a rocket containing a fresh Grade A medium egg (known as the astronaut), have the rocket's chute fully deploy, and *try* to land the rocket within the designated splashdown area (which was located, by the way, in the Severn River). Besides these criteria, winners were determined in seconds—the time from liftoff to apogee being added to the time of total duration and 30 seconds subtracted from the total time if the rocket missed the splashdown area. Unfortunately, the splashdown area just wasn't large enough and most of the rockets missed the spot completely, making for quite a few negative total times.

To say the least, LEAP-1 was a unique attempt at a rocket meet. The recovery teams weren't exactly ordinary due to their amphibious nature, and were therefore dubbed the "Frogmen". In keeping with the watery theme, the beach area and the inhabitants thereof found themselves invaded by a horde of Vikings (also known as the Maryland Medieval Mercenary Militia) who made their entrance and exit via an authentic Viking ship.

It was great weather for a shoot, with very little wind and no rain to mar the competition. All told, over 30 people from 4 sections and 3 states came to enjoy the day's activities, which included a picnic and an awards ceremony where the trophies were ceramic frogs.

In retrospect, LEAP proved a successful meet, and showed that nonsanctioned competition can be as much fun as sanctioned competition if given the chance.



NAR President Jim Barrowman looks at the remains of his LEAP 1 entry. (Photo by Tom Lyon - NARAMS)

The HONOROCS (section #302) of Honolulu, Hawaii, is presently working with the Geophysics Department at the University of Hawaii on the possibilities of developing a program to use model rockets to replace radiosonde balloons in certain research applications, during upper atmosphere tests from small research vessels, where the great space necessary in the inflation of helium balloons is not available.

A design is now being developed that will carry the 4 oz. transmitter to an approximate altitude of 10,000 feet using a two stage "F" engine vehicle. Various tests of temperature, humidity, etc., would be taken during these flights.

Congratulations to the Pueblo Association of Rocketry (section #272) on the publication of Vol. 1, No. 1 of their newsletter "*Falling Star*". Good luck.

HOOSIER'S EXTRA LARGE LAUNCH '73

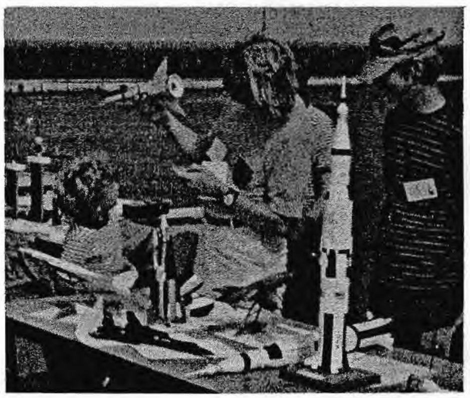
by Tom Hoelle

Tom Hoelle is a member of the Summit City Aerospace Modelers of Fort Wayne, Indiana. He currently serves as president of that section. He is one of the founders and past president of the former Smoking Saturns club. Model rockery has been his hobby for six years, and he has been a NAR member for two. Tom is a freshman at the Purdue University extension in Fort Wayne.

Hoosiers' Extra Large Launch '72, or H.E.L.L. '72 got under way on August 26 at Muncie, Indiana. This launch was the first non-sanctioned Indiana state-wide launch. It was held on the campus of Ball State University, next to a corn field. The site proved to be adequate as very few of the rockets launched at H.E.L.L. '72 were lost.

H.E.L.L. '72 got under way as a volley of red, white, and blue Nike Smokes was fired. Competition turned serious with the first event, Sparrow Rocket Glider. The results indicate that the rocket gliders could have been better. The winner of Sparrow RG for Class A (not NAR-A division) was Greg Stewart of Fort Wayne, with a modified boost/glider called the American Eagle. Greg got a 13.5 second flight. There were no other qualified flights for Class A. The Class B winner was Tom Hoelle of Fort Wayne, flying a Waterbucket. The winning time was 65 seconds. John Kalb of Fort Wayne and Gary Bannister of Indianapolis came in second and third respectively.

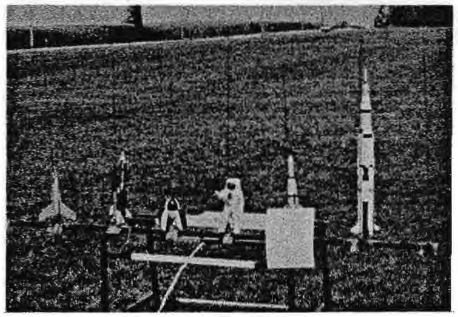
The next event, though long awaited, disappointed many. That event was Class 2 Underwater Streamer Duration. Most of the entrants used a tower and loaded the rocket and igniter with wax and vaseline. After this was done, the rocket was placed on the tower. The tower was then lowered into the water, and the countdown began. Others used a clear plastic tube on a plywood base or a garbage can to launch their underwater rockets. To show how tough the competition was, there were no qualified flights in Class B. The winner in Class A was Mike Kalb of Fort Wayne, who used a form of piston tube where the body tube caught the fins on liftoff, with a time of 44 seconds. Ron Maze of Indianapolis, Mat Fertig of Indianapolis, and Jeff Sills of Fort Wayne captured second through fourth places respectively.



H.E.L.L. '72 judges inspect the Plastic Model entries. In the background are the trophies that were presented to the winners. (Photo by Greg Stewart)

Plastic Model brought out quite a few interesting entries. One of the most unusual was a flying astronaut made and flown by Harry Neuman. The only trouble with it was that it did not want to take off from the launcher. Other models flown were Saturn V's, a Mars Probe, an XB-70, and a Blue Angel. First place in Plastic Model went to Greg Stewart, who flew an Enerjet-powered Saturn V. Second place went to John Ruthroff of Indianapolis with an F11, and third place went to Mike Kolb with a clustered Navy Blue Angel. Class B was won by Tom Hoelle with his Mars Probe. Second place went to Dave Wyss who flew a flying Leggs capsule. After all of the pieces of the plastic models were returned, everyone took time out for lunch.

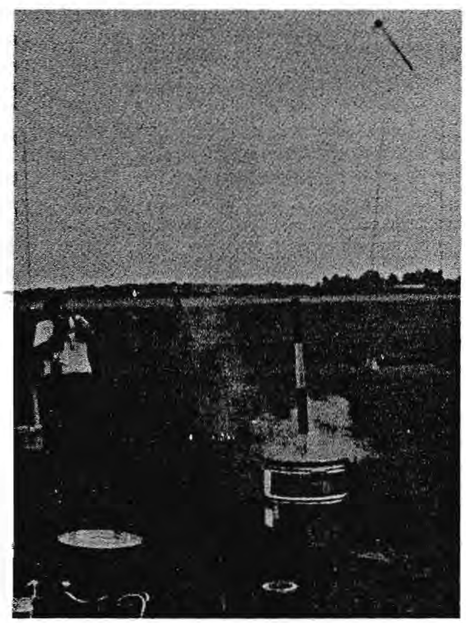
During lunch all three racks were being prepared for the demo to follow. AVI and FSI, as well as several rocketeers, donated models



The plastic models on the rack ready for launch. (Photo by Greg Stewart)

for the demo, so almost all of the manufacturers were represented. There were several spectacular flights, but perhaps the most interesting was an F100 powered Flying Alfred featuring a hand-rolled body tube.

After the demo, Class O Parachute Duration was flown. Two piston launchers made their appearances for the first time since they won several first places at MMRR-72. Unfortunately, large parachutes and thermals do not go together, as several contestants found out. The winning rocket was last seen still being carried upward by a thermal over some apartments about one-half mile away. The winning flight was made by Ron Maze with 77 seconds. Greg Stewart, Bill Humphries of Fort Wayne, and Dennis Dunkman of Indianapolis placed second through fourth. Gary Bannister won Parachute Duration in Class B with 44.3 seconds, followed by Harry Neuman of Indianapolis and John Kalb.

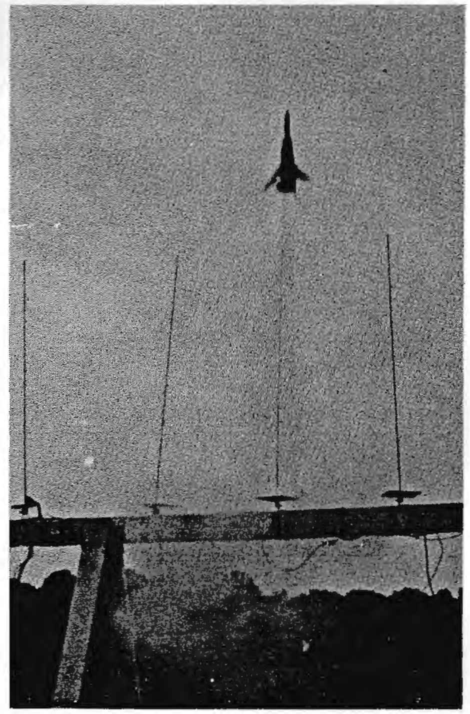


An unsuccessful Class 2 Underwater Streamer Duration bird tumbles out of the tower towards a DQ. (Photo by Tom Hoelle)

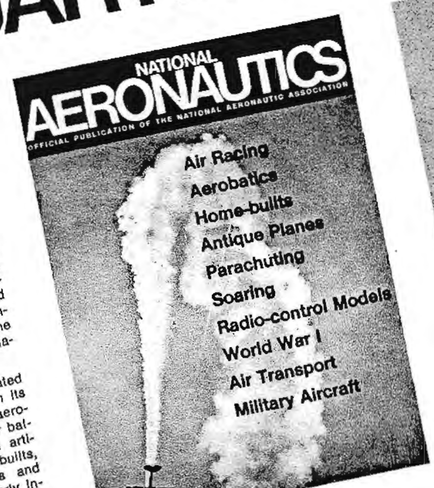
Sparrow Rocket Glider was the last event flown at H.E.L.L. '72. Several promising flights hinted at the outcome as Greg Stewart took first place with an American Eagle with a time of 70 seconds. Following Greg were Ron Maze and Mat Fertig. Class B honors were won by Tom Hoelle flying another Waterbucket. Following close behind were John Kalb and Gary Bannister.

Although H.E.L.L. '72 was intended to be an Indiana state wide launch, it seems that it was a contest between Indianapolis and Fort Wayne, with Fort Wayne prevailing. AVI, FSI, and Centuri donated prizes, and the cost of the trophies was split between the clubs represented. When the results were tabulated, Fort Wayne took the overall club trophy with Indianapolis winning the runner-up position. Greg Stewart took first place overall, with the runner-up trophy going to Tom Hoelle and third place overall to Gary Bannister. After putting the equipment away, the contestants talked of H.E.L.L. '73—or will it be H.E.A.V.E.N. '73?

Harry Neuman preps his flying astronaut. (Photo by Tom Hoelle)



The winning Class B Plastic Model entry, a Mars Probe, takes off. (Photo by Tom Hoelle)



FEATURE PLAN

Juliee-Bird V Rocket Glider

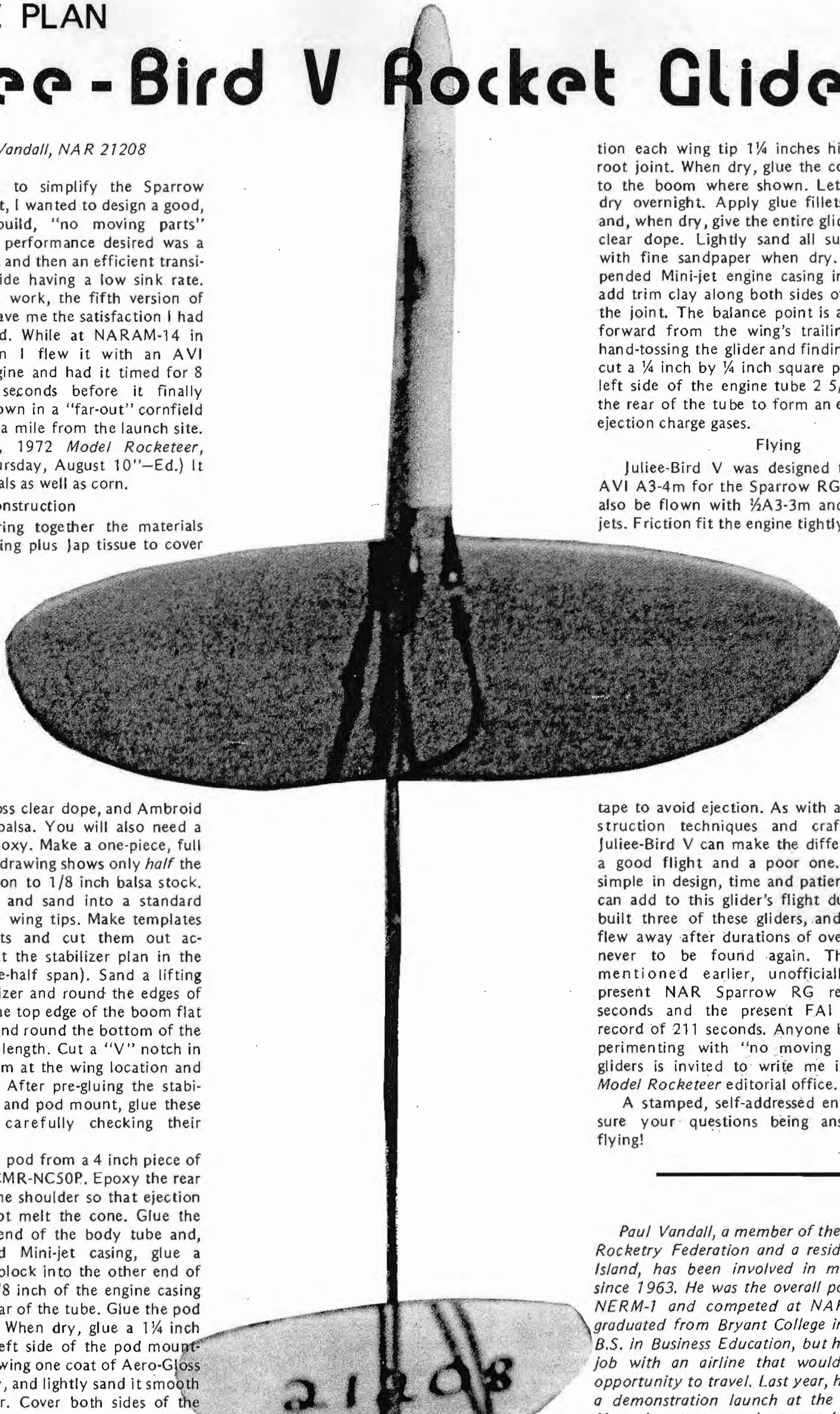
by Paul D. Vandall, NAR 21208

As an attempt to simplify the Sparrow Rocket Glider event, I wanted to design a good, reliable, easy-to-build, "no moving parts" rocket glider. The performance desired was a clean vertical boost and then an efficient transition into a flat glide having a low sink rate. After one month's work, the fifth version of this rocket glider gave me the satisfaction I had been trying to find. While at NARAM-14 in Seattle, Washington I flew it with an AVI A3-4m mini-jet engine and had it timed for 8 minutes and 45 seconds before it finally decided to come down in a "far-out" cornfield about one third of a mile from the launch site. (See the October, 1972 *Model Rocketeer*, page 7, under "Thursday, August 10"—Ed.) It seems to like thermals as well as corn.

Construction

Start by gathering together the materials shown in the drawing plus Jap tissue to cover the wings, Aero-Gloss clear dope, and Ambroid liquid cement for balsa. You will also need a small amount of epoxy. Make a one-piece, full wing template (the drawing shows only *half* the wing) and trace it on to 1/8 inch balsa stock. Cut out the wing and sand into a standard airfoil, tapering the wing tips. Make templates for the other parts and cut them out accordingly (note that the stabilizer plan in the drawing is also one-half span). Sand a lifting airfoil in the stabilizer and round the edges of the rudder. Leave the top edge of the boom flat (factory-cut edge) and round the bottom of the boom along its full length. Cut a "V" notch in the top of the boom at the wing location and pre-glue the notch. After pre-gluing the stabilizer, rudder, boom and pod mount, glue these parts together, carefully checking their alignment.

Make the engine pod from a 4 inch piece of CMR-RB50 and a CMR-NC50P. Epoxy the rear end of the nose cone shoulder so that ejection charge gases will not melt the cone. Glue the nose cone in one end of the body tube and, using an expended Mini-jet casing, glue a CMR-EB50 engine block into the other end of the tube so that 1/8 inch of the engine casing extends from the rear of the tube. Glue the pod to the pod mount. When dry, glue a 1¼ inch launch lug to the left side of the pod mount-pod joint. Give the wing one coat of Aero-Gloss clear dope; let it dry, and lightly sand it smooth with fine sandpaper. Cover both sides of the wing with Jap tissue in the usual manner. When dry, cut the wing in half, bevel and pre-glue each root-chord so that a 1¼ inch dihedral is obtained. When gluing the wing together, position each wing tip 1¼ inches higher than the root joint. When dry, glue the completed wing to the boom where shown. Let the assembly dry overnight. Apply glue fillets to all joints, and, when dry, give the entire glider one coat of clear dope. Lightly sand all surfaces smooth with fine sandpaper when dry. Insert an expended Mini-jet engine casing in the pod and add trim clay along both sides of the rudder at the joint. The balance point is about 3/4 inch forward from the wing's trailing edge. After hand-tossing the glider and finding its flat glide, cut a ¼ inch by ¼ inch square piece out of the left side of the engine tube 2 5/8 inches from the rear of the tube to form an escape vent for ejection charge gases.

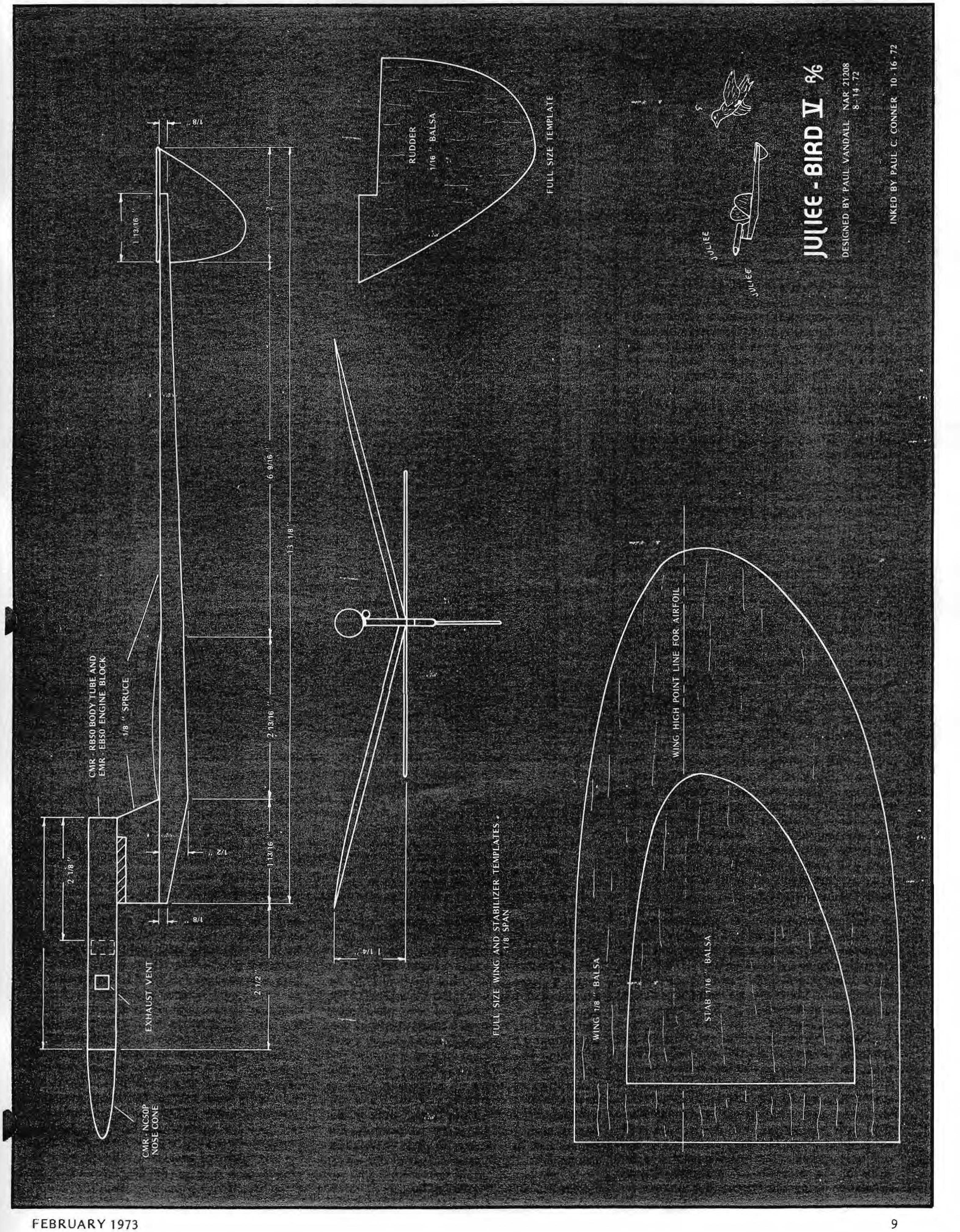


Flying

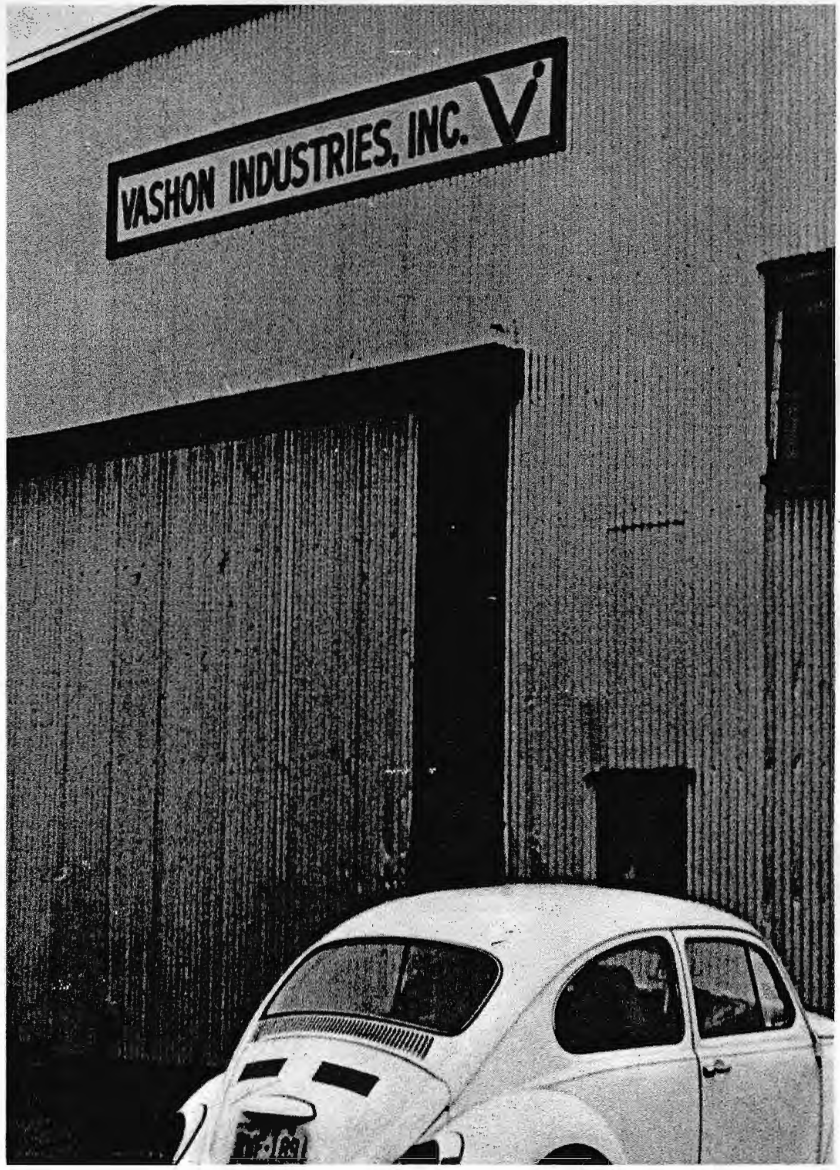
Juliee-Bird V was designed to fly with an AVI A3-4m for the Sparrow RG event but can also be flown with ½A3-3m and B3-5m Mini-jets. Friction fit the engine tightly with masking tape to avoid ejection. As with all gliders, construction techniques and craftsmanship on Juliee-Bird V can make the difference between a good flight and a poor one. Though it is simple in design, time and patience in building can add to this glider's flight duration. I have built three of these gliders, and two of them flew away after durations of over 5½ minutes, never to be found again. The third one, mentioned earlier, unofficially broke the present NAR Sparrow RG record of 194 seconds and the present FAI Sparrow B/G record of 211 seconds. Anyone building or experimenting with "no moving parts" rocket gliders is invited to write me in care of the *Model Rocketeer* editorial office.

A stamped, self-addressed envelope will assure your questions being answered. Good flying!

Paul Vandall, a member of the New England Rocketry Federation and a resident of Rhode Island, has been involved in model rocketry since 1963. He was the overall point winner at NERM-1 and competed at NARAM-14. Paul graduated from Bryant College in 1970 with a B.S. in Business Education, but he would like a job with an airline that would give him an opportunity to travel. Last year, he took part in a demonstration launch at the University of Massachusetts to convince state 4-H leaders that model rocketry could be a worthwhile activity to include in their program. In competition, Paul finds the glider events most challenging.


JULIEE - BIRD V R/G
DESIGNED BY PAUL VANDALL NAR 21208 8-14-72
INKED BY PAUL C. CONNER 10-16-72
JULIEE
JULIEE
RUDDER 1/16" BALSA
FULL SIZE TEMPLATE
CMR - RB50 BODY TUBE AND EMR - EB50 ENGINE BLOCK
1/8" SPRUCE
EXHAUST VENT
CMR - NC50P NOSE CONE
2 1/8"
2 1/2"
1 13/16"
2 13/16"
6 9/16"
13 1/8"
2"
1 13/16"
1/8"
1/2"
1 1/4"
FULL SIZE WING AND STABILIZER TEMPLATES 1/8 SPAN
WING HIGH POINT LINE FOR AIRFOIL
WING 1/8" BALSA
STAB 1/16" BALSA

NEW
FROM THE MANUFACTURERS



According to Al Forsyth of Vashon Industries, Vashon began its move to Penrose, Colorado about one year ago, following their becoming a subsidiary of Damon. Estes will continue production and marketing of the cold propellant model, while Vashon Industries will cease to exist. K2 Industries, makers of the famous red, white, and blue skis, will move into the vacated steel barn pictured above soon, since Vashon finished clearing out in early November.—Tony Medina

ROCKET ENGINES

It took about fifteen years coming, but there is finally a Canadian engine manufacturer. We don't have too much information yet, but we do know that their engines have been approved by the Department of Energies, Mines, and Resources. The company is Shand Industries, 22 Loyola Bay, Winnipeg, Manitoba, Canada R3T 3J6.

(Potential U.S. customers: better check with customs and S&T first.)

BOOK REVIEW

Model Rocketry: Hobby of Tomorrow by Peter Lowry and Field Griffith, 1st Edition, 1971, Doubleday and Company, Inc., $4.50.

The jacket of *Model Rocketry* tells us that the book is "the first comprehensive guide book to this popular Space Age hobby." It goes on to say, "This guide ... is intended for beginners and professionals alike." The book hardly lives up to either statement. It comes nowhere near G. Harry Stine's *Handbook of Model Rocketry* as a comprehensive work, it may confuse the beginner, and would not be advanced enough for the "professional."

The first chapter discusses the safety reasons for choosing model rocketry over amateur activities or basement bombing. Chapter 2 talks about construction techniques. Some important points and definitions are skipped here. For example, beginners are told that fins "should be cut so the balsa grain lies parallel to either the leading or trailing edge." They are never told, however, just which edges of the fin are the leading and trailing edges.

Solid and liquid model rocket propellants are discussed in Chapter 3. Propellant, thrust, total impulse, thrust-time curves, etc. are covered adequately here. In the next chapter igniters, ignition methods, and launch systems are included. Directions for building a simple launch system are given.

Chapter 5's discussion of stability, flight dynamics, drag and altitude calculations leaves much to be desired. The cardboard cut-out method of determining stability is the most advanced one given. Since the bibliography for Chapters 5 through 8 seems to be missing I can't tell whether or not the authors even know about them. The descriptions of stability and weathercocking are not adequate, and the terms in the discussion of drag and altitude calculation using the Malewicki equations are hazy.

Other chapters discuss recovery systems, staging, clustering, payloads, egglofting, cameras, and instrumentation. *Model Rocketry* contains a statement about transmitters which I found quite amazing: "Still very much in the experimental stage are radio transmitters. The reason this has not been developed more rapidly is that, although a transmitter may cost only about $20, several hundred dollars worth of ground equipment is needed to receive and process the signal. Theoretically, these radio transmitters could be used to signal back information on acceleration, yaw, pitch and roll, and the shock of launching and recovery system deployment. Until someone perfects this method, we have to rely on self-contained instruments."

Boost/gliders (no mention is made of rocket gliders), "big rockets", tracking, research and development, science fair projects, and clubs are covered in the remaining chapters. Many of the drawings and photographs are poor, but the "Selected Readings" portion of the book contains a good list of NAR, Estes, and Centuri technical reports, and rocketry books and magazine articles (although some of the references are a bit dated).

Summing up, *Model Rocketry: Hobby of Tomorrow* might be useful to a beginner desiring a very broad work that will tell him where to look for what (except for the subjects covered in Chapters 5 through 8, of course) and who won't be discouraged by having to look elsewhere for a good explanation of something. For the advanced rocketeer, it hasn't much to offer.

—*Elaine Sadowski*

A LETTER TO THE TECHNICAL EDITOR

(Editor's note: This letter was originally written to NAR President Jim Barrowman, and then forwarded to Pat Stakem.)

Dear Jim,

I am seeking your help on a project I am about to undertake for school. For a semester project in Physics I plan to attempt to fire a rocket at or beyond Mach 1.

My major problem at this time is the design of the rocket. I understand that strange things happen to the CP and CG near the speed of sound. I need to know, what this will do to the stability of the rocket. Must I make the rocket "super stable" by increasing nose weight, or will the rocket remain stable at this speed even though the CP may be ahead of the CG?

Also, I need an accurate and reliable method of determining the CP and CG. I understand that you have done some work on this subject. How can I find out about it? I also need to find the best design for this rocket. What fin shape would be the best: elliptical or clipped delta—or neither? What about the best ratio ogive for the nose cone at this speed? Will the Mach 1 design hinder the rocket at subsonic speeds?

Has there been any documented research in this area by anyone else?

If you could answer these questions directly or refer me to a source for the answers I would certainly appreciate it. My project is due in December, so please answer me promptly.

At the present time I am planning a two stage rocket using single F engines. I will probably use FSI Fs unless Enerjets prove to give me a better acceleration.

Thanks!

Sincerely,
David M. Scott
Apollo/NASA
Houston, Texas

Dear Dave,

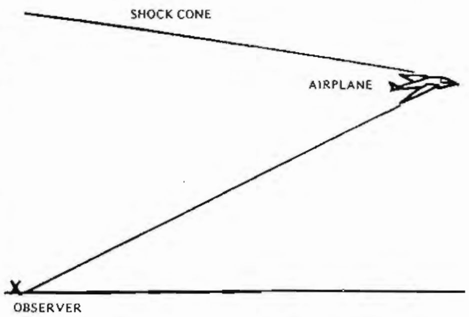
Your letter was referred to me by NAR HQ for answer.

I think the best you'll get from a Mach 1 modroc project is a design analysis. There have been reports of breaking the sound barrier, but they are not supported by hard evidence. I looked at the problem a few years ago and decided that it could be done by firing the vehicle down from a height so that gravity helps and doesn't hinder; obviously, this shouldn't be attempted from a safety standpoint.

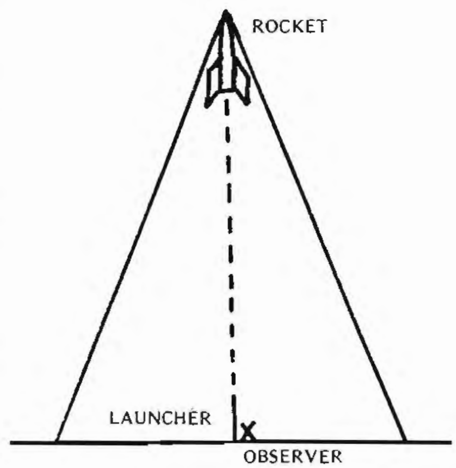
True, strange things happen to CP/CG during near-sonic flight. That's the least of your worries. The average model rocket will exceed the "speed of balsa" before it approaches Mach 1. Aerodynamic heating becomes a severe problem at these speeds because the heat generated in the vehicle by the impacting air molecules can't be dumped fast enough. Thus, epoxy coatings must be used on leading edges to prevent charring and burning.

As you mention, the aerodynamics of a vehicle designed for transonic flight differ from those of a subsonic vehicle. Thus, something designed for breaking Mach 1 may be unstable at lower speeds. Close to Mach 1, the drag force goes up as velocity raised to the third, or even higher, power, so normal modroc velocity/altitude calculating programs don't give accurate answers.

Lastly, the biggest problem. How do you know the vehicle has achieved Mach 1? The sonic boom? Well, you hear an airplane because the disturbance cone intersects the ground:



But for a rocket in vertical flight, you would't necessarily hear the shock:



As for your specific questions, the best nose cone shape would probably be conical, and the fins should be thin wedges instead of the standard symmetrical airfoil.

I didn't mean to discourage you, but I hope I pointed out some of the problems involved, and the areas you should look into. Data really doesn't exist. What is the CP shift for a model rocket from .9 Mach to 1.1 Mach? No one knows.

When you do get a transonic flight documented, send me the report for publication in the *Model Rocketeer.*

Yours truly,
Pat Stakem

P.S. I just talked to Jim Barrowman, and got this additional information. His CP report assumed, essentially, that Mach number approached zero.

The key lies in the CN_α term for the fins. Actually,

$$\overline{CN_\alpha} =$$

$$2\pi(AR) \times (A_{fin}/A_{ref}) \,/\, (2 + \sqrt{4 + \beta(AR)/\cos\gamma}).$$

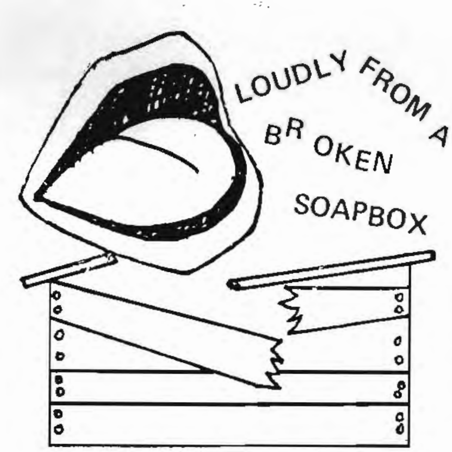
$$AR = \text{aspect ratio} = \frac{2 \times \text{Span}^2}{\text{Area of fin}}$$

$$\beta = \sqrt{1 - \text{Mach } \#^2}$$

γ = average sweep angle of fin

A_{ref} = reference area of vehicle = area of nose

Essentially the CP moves aft, making the vehicle more stable. If you can use this modified C_α fins in Barrowman's equations to get a two caliber or better static margin the bird should be stable at Mach 1. No guarantee beyond.



The opinions expressed in this column are those of the author alone, and they do not necessarily reflect those of the Model Rocketeer *or the NAR.*

WHERE ARE THE SCALE PACKETS?

By Jonathan Rains, NAR 13911

My major charge against the LAC is their inability to produce results out of promises. In August, 1971 the *Model Rocketeer* reported that the LAC was engaged in drawing up a set of plans that would form a scale packet which would be available to the general membership through NARTS. In that issue, Charles Russell, then in charge of the project along with Doug Ball, wrote that plans for the IQSY Tomahawk would soon be available. Since that time no new plans have been released by NAR Technical Services to my knowledge. Currently the only scale plans available from them are the so called "Scale Model Rocket Plans" which are mainly based on the prehistoric BT-40 body tube and the "Rock-A-Chute" model rocket system. Published in 1961, these antiques are unworthy of publication by today's standards.

Today the NAR, as a nationwide organization, should have no difficulty in obtaining blueprints and photographs of sounding rockets from their manufacturers. Securing plans for such new rockets as the UTE Tomahawk, Boosted Arcas II, and the Super Arcas would add diversity to the current scale contests which are too often dominated by one or two prototypes.

Come on LAC; get those scale packs off the drawing board and into the modelers' hands.

IF I PRINTED THE PINK BOOK

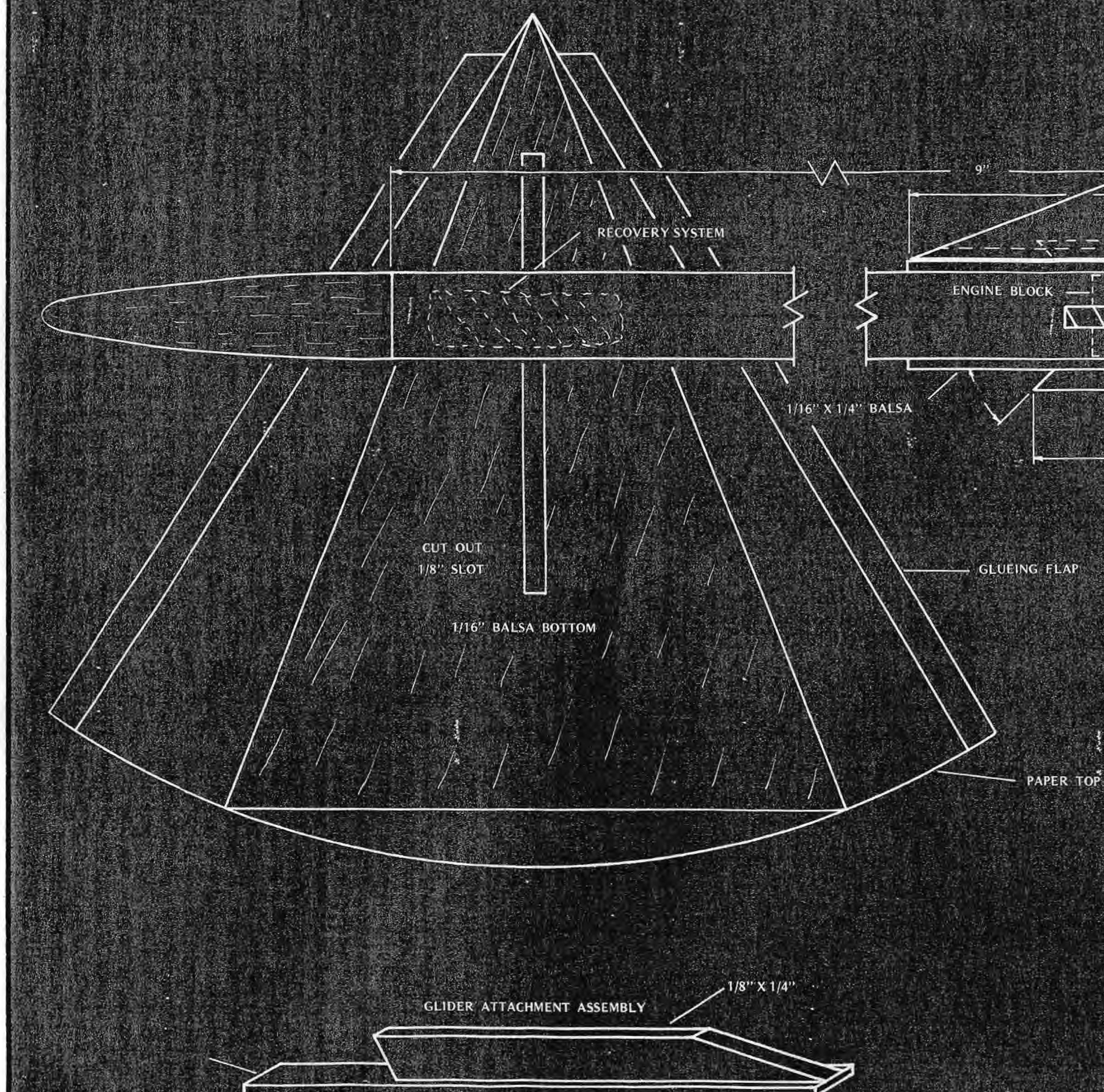
By Mark Barkasy, NAR 5038

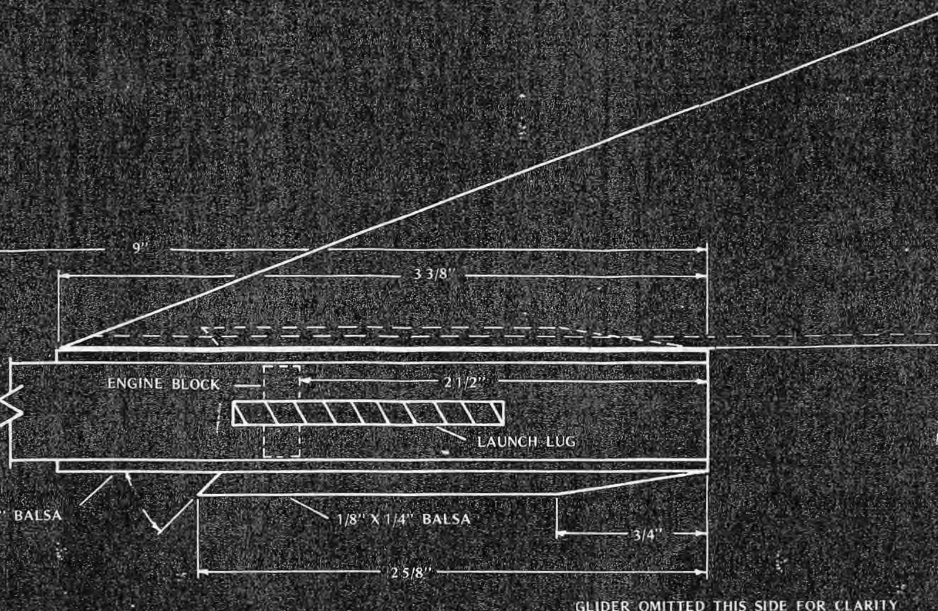
I do not know when or if there is going to be another reprinting of the Pink Book but if there is I have some suggestions on *how*, not *what*, it is to be printed.

If the costs prove to be less, I wish for the next Pink Book to be loose-leafed (the member would supply his or her own notebook). The pages would be separate 8½ by 11 inch sheets of three-hole ring style.

My reasoning for this suggestion is that if each event is placed on separate sheets, instead of replacing the whole Pink Book when revisions come about, one could replace just one page or add one or more pages. When an important revision comes about, the NAR may send a special replacement page separately or send it as a clip'n punch sheet printed in The *Model Rocketeer.*

(Continued on page 15)





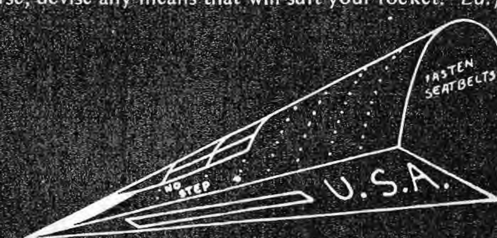
GLIDER OMITTED THIS SIDE FOR CLARITY

A couple of months ago I came across the information that a lifting body was just a fancy half-cone. After a little thought and work, I designed "The Flying Wedge", a parasite B/G for sport flying. It consists of two parts, a balsa frame and a paper cone. The flat side is down.

The Flying Wedge has a glide ratio of about 3:2 and a sink rate of about 4 fps. when properly trimmed (This can be accomplished by putting drops of glue in the tip). To balance drag, it should be flown in pairs on opposite sides of the rocket.

–Frank Parlini, NAR 19532

(A method of attaching the glider is shown on our plan, but you can, of course, devise any means that will suit your rocket.–*Ed.*)



THE FLYING WEDGE

PARASITE GLIDER

DESIGNED BY FRANK PARLINI

DRAWN BY P.C.C. II 8-2

NAR NEWS

ANOTHER NAR MEMBER'S PROJECT SELECTED FOR SKYLAB

Keith McGee, NAR 21273, of the Dallas Area Rocket Society, was chosen as one of the 25 students whose experiments have been selected to be performed in conjunction with NASA's Skylab. Keith's project, "The Effect of Zero Gravity on the Colloidal State of Matter," won't be on board Skylab, but it will be performed with data obtained from Apollo 14 and 16 electrophoresis experiments.

INTERVIEW WITH JOHN MALACHOWSKY

Recently the major U.S. newspapers and network news programs ran stories about a young fellow who felt that the raise in price of model paint was unfair and told the President's Price Commission about it. Twelve-year-old John was photographed with a Saturn V, which prompted the *Model Rocketeer* to request that I try to get an interview with him.

John, unfortunately, has never heard of the NAR. He builds and flies alone. I explained how sections are set up and what they do and invited John to come to a meeting of my section, the Phoenix Model Rocket Section.

Since John lives a bit far from my section to attend meetings, I suggested that he start his own section. John was more than interested in the idea—he was thrilled. I told him he would need nine fellows or girls who are interested in model rocketry and one adult. John was surprised to hear that girls also build and fly rockets. I will be getting together with John after the holidays, and, as part of my job as New York City Coordinator for Section Activities, helping him to form a section.

When asked whether he wanted to go into rocketry as a career, John replied that he wants to become a bacteriologist. He said that he was "shocked" at his sudden fame, but that it also gave him a good feeling.

—Fred Kushner

NEW ROCKET CLUB IN OHIO

Students at the Lucas Local School in Mansfield, Ohio, are starting a rocket club. Their science teacher, Mr. Van Dine, is the club's adviser.

TRUSTEE NOMINATIONS

A Reminder: All nominations for the NAR Board of Trustees must be sent to Jay Apt by April 15. Nominations must be accompanied by a letter indicating the consent and home address of the nominee. The 150 word resume must also be in by April 15. Any NAR member may nominate any Senior member for the Board. Send nominations and resumes to Jay at 370 Concord Avenue, Cambridge, MA 02138.

CANADIAN NEWS NOTES

by Steve Kushneryk

Canadian Association of Rocketry

The CAR met in Ottawa on September 30 to discuss the formation of an advanced rocketry group. The catalysts for the meeting were the activities of the Scientific Applications Group of the Atmospheric Rocket Research Association and the Association des Jeunes Scientifiques. Both groups are Quebec based and already involved in advanced rocketry at the Space Research Corporation's aeroballistic lab and range at Highwater, Quebec, near the Vermont border. ARRA has been following the use of the industrial rocket engines from Enerjet, and the AJS has been using French engines with total impulses of up to 5650 newton-seconds.

CAR called the meeting to see if there would be a possibility of setting up a national program if there is sufficient interest. It is hoped that such a program would be able to include rockets, balloons, satellites, telemetry and associated equipment, radio telescopes, ERTS, and ground stations. Investigations are now being made as to launch sites, government assistance, the number of interested persons, and perhaps the use of some of the surplus equipment from the now deserted Bomarc missile sites in Quebec and Ontario. Interested parties should write CAR, c/o Youth Science Foundation, 151 Slater Street, Ottawa, Canada, K1P 5H3.

Perhaps the day may not be too far off when a rocket club can fully engineer an experiment and ship it down to a launch site for mating on a carrier vehicle.

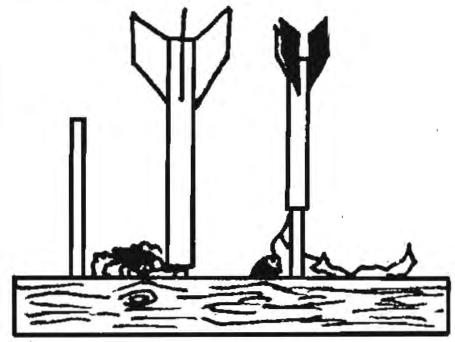
A regularly scheduled Canadian Association of Rocketry Advisory Committee meeting was held on November 11. The main topic of discussion was the sporting code (dubbed the COOK BOOK after Peter Cook, who wrote it) and the Canadian Nationals to be held in 1973.

It is expected that the COOK BOOK will be available in February (French language edition in March). Thus CAR hopes that a good number of meets will be organized in time for summer.

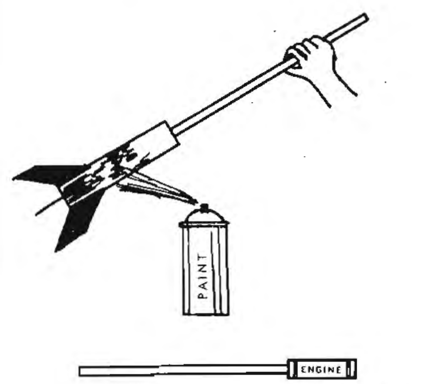
Edmonton was officially named to host CARNAT (Canadian Annual Rocketry Nationals) in Alberta on August 17th, 18th, and 19th, 1973. Events to be flown include Scale Altitude (Cl.0), Sparrow B/G, Eagle B/G, Egglofting (20 Nt-sec), Scale, Parachute Duration, Open Streamer Duration (Cl.3) and *Research and Development.*

MODEL ROCKET TIPS

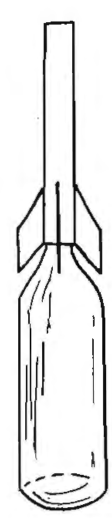
Rocket storage without fin breakage—use a heavy base (1 inch thick or better) and put fins *up.* It works!



Spray painting? Try a helping hand.



Need a glue-drying support for large body tubes? Grab a pop bottle.



—David Newill

AIAA STUDENT MEMBERSHIP

The American Institute of Aeronautics and Astronautics has recently passed a resolution which makes student memberships available to high school students.

With 25,000 members, AIAA is a professional society devoted to science and engineering in the field of Aerospace. AIAA student membership affords a challenging educational experience at a cost of only $5 per year. For this small sum the student receives *Astronautics & Aeronautics*, AIAA's monthly magazine, and the *AIAA Student Journal*, which is published four times a year.

Any high school student with a strong interest in Aerospace, interested in becoming a Student Member of the American Institute of Aeronautics and Astonautics should write to: Raymond I. Gorski
Director of Student Programs
AIAA
1290 Avenue of the Americas
New York, New York 10019

Contest Calendar

SEND EARLY FOR CALENDAR!

Please submit all items for the *Model Rocketeer* "Contest Calendar" at least two months in advance! Contest Calendar items should be typed and sent directly to Elaine Sadowski, Editor, *Model Rocketeer* at 1824 Wharton Street, Pittsburgh, Pa. 15203.

The following are contests that have been *sanctioned* by the National Association of Rocketry. Points earned at these contests are credited toward national standings.

February 4, 1973—Mendon, Massachusetts. Name: NERFSEC—4. Host: N.E.R.F. 236. Events: Scale, Class 0 Parachute Duration, Class II Streamer Duration, Sparrow Boost/Glide, Sparrow Rocket Glider, Hawk Boost/Glide. Contact: Patrick M. Griffith, Legion Street, Milford, Massachusetts 01757; 473-7654.

February 11, 1973—Bridgewater, Massachusetts. Name: MITSEC—4. Host: MITMRS 134. Events: Design Efficiency, Class 00 Altitude, Ostrich Eggloft, Class I Drag Efficiency, Peewee Payload, Robin Eggloft. Contact: Trip Barber, MITMRS, MIT Branch P.O., Box 110, Cambridge, Massachusetts 02139.

March 9, 1972—Bridgewater, Mass. Name: MITSEC—5. Host: MITMRS 134. Events: Hornet B/G, Hawk Rocket Glider, Sparrow B/G, Class 1 Streamer Duration, Class 2 Streamer Duration, Class 0 Parachute Duration, Eagle Rocket Glider. Contact: Trip Barber, MITMRS, MIT Branch, P.O. Box 110, Cambridge, Mass. 02139, (617) 253-3161.

March 18, 1973—Piscataway, New Jersey. Name: FAR V. Host: Fanwood Association of Rocketry. Events: Robin Eggloft, Predicted Altitude, Scale, Swift Boost/Glide, Hornet Rocket Glider. Contact: A. L. Lindgren, 15 Hunter Avenue, Fanwood, New Jersey 07023, 322-2248.

April 13, 14, 15, 1973—Camp A.P. Hill, Virginia. Name: East Coast Regional Meet VII (ECRM-VII). Host: NARHAMS 139. Events: Scale, Ostrich Egg Loft, Hawk Boost/Glide, Hawk Rocket Glider, Class 0 Parachute Duration, Class 0 Streamer Duration. Contact: Judith A. Barrowman, 6809 97th Place, Seabrook, Maryland 20801. Phone (301) 459-5261.

May 5-6, 1973—Oconomowoc, Wisconsin. Name: W.U.R.M.-1. Host: OMRS #294. Events: Gnat, Sparrow, and Hawk Boost/Glide, Hornet and Swift Rocket Glider, Class 00 Parachute Duration, Class 0 Streamer Duration, Scale. Contact: W.U.R.M.-1, Tom Gressman, 940 Silvercrest Ct., Apt. #1, Oconomowoc, Wisconsin 53066.

June 2-3, 1973—Philadelphia, Pennsylvania. Name: AARDVARK-II. Host: S.P.E.A.R. #286. Events: Predicted Altitude, Robin

R&D summaries

The opinions expressed in this column are those of the author alone, and they do not necessarily reflect those of the Model Rocketeer *or the NAR.*

INVESTIGATING CONICAL STABILIZERS

by Jeff Chandler, NAR 13632
800 W. Walton Ave., Dalton, Ga. 30720

The conical stabilizer has come into prominence in the field of model rocketry only in the past few years. At the time of the inception of this investigation, the conical stabilizer was in use only in full-scale rocketry. I do not claim to be the first model rocketeer to utilize the conical stabilizer, but I do claim that the designs for my conically stabilized models are my own and were not inspired by another model rocket of similar design.

The models used in this project were designed and constructed to fulfill the objectives of the project. Three stabilizer diameters were used for the models so that stabilizer diameter could be investigated; two body lengths and two body diameters were used to determine the relation of the body to the efficiency of the stabilizer. (The efficiency of the conical stabilizer was determined in terms of its coefficient of drag.)

This investigation was approached by flying each model and measuring the altitude it attained. This altitude was then reduced to the drag coefficient with the help of model rocket altitude prediction charts. The models were tested in a wind tunnel before flight for stability to insure safety. Films were made of the flights and would have been valuable as a cross-check for the drag coefficient values had they been of high quality. Unfortunately, the films were not good enough to be of value to the investigation. The drag coefficients obtained from the altitude charts were broken down into groups according to the portion of the investigation under consideration.

The conical stabilizer configuration for model rockets has proven to be workable at the very least, and in some ways advantageous. It serves to move the center of pressure aft on the rocket much as fins would, with less space being used to do it. Only break-away or nose-blow was used to recover the models in this investigation. None of the models were damaged by the free falls; finned rockets would certainly have been damaged. One drawback to the conical stabilizer's use is the high drag which seems to result from it. The average drag coefficient was about 1.10. My tracking systems were certainly not without fault, but this should not affect the overall results.

It was found that the diameter of the stabilizer is inversely proportional to the coefficient of drag. Thus, as the diameter increases, the drag coefficient decreases. Under the assumption that this information is correct, I interpret the data to mean that the larger stabilizer diameter results in a larger drag moment along the longitudinal axis, causing the rocket to be more stable. The total drag does not change, but the reference area is larger, and the coefficient of drag is smaller.

The angle that the conical stabilizer makes with the body I call the cone angle. My data tells me that the cone angle is directly proportional to the coefficient of drag: as the cone angle decreases, so does the C_d. The commercially available "reduction fittings" have cone angles of about twelve degrees and should be fine for most purposes. The better performing models in this investigation were those with the higher body-length-to-body-diameter ratios, the larger stabilizer diameters, and the lower cone angles. Put all the "betters" together on one model and you have a good sport or competition model that takes less time to build and lasts longer than standard finned designs.

Calendar (continued from page 14)

Eggloft, Single Payload, Plastic Model, Swift Rocket Glider, Sparrow Boost/Glide, Eagle Boost/Glide, Scale, Class 1 Streamer Duration, Class 1 Parachute Duration. Applications accepted no later than April 20. Contact: Carl J. Warner, 665 Woodland Avenue, Pottstown, Pennsylvania 19464. Telephone: (215) 323-4296.

Date To Be Announced—Highland Park, Illinois. Name: ERT2, Evanston Tiros Regional. Events: Hornet Boost/Glide, Condor Boost/Glide, Eagle Rocket Glider, Design Efficiency, Class II Streamer Duration, Class 0 Parachute Duration, Pee Wee Payload, Robin Eggloft, Research and Development. Contact: Bob Finch, 415 Lambert Tree, Highland Park, Illinois, Phone (312) 432-8986.

CONVENTIONS, SYMPOSIUMS, ETC.

Washington's Birthday Weekend 1973—New York, N.Y. New York Star Trek Convention, Commodore Hotel. Contact: Mr. Al Schuster, Box 95, Old Chelsea Station, New York, N.Y.

March 16-17-18, 1973. Pittsburgh, Pennsylvania. 8th Pittsburgh Spring Model Rocketry Convention. Discussion groups on clubs, competition, electronics, tracking and many other topics. Movies, lectures, banquet, and a special seminar for teachers. Contact: Elaine Sadowski, 1824 Wharton Street, Pittsburgh, Pennsylvania 15203. Telephone: (412) 431-5139.

March 30-April 1, 1973—Cambridge, Mass. Name: 1973 MIT Technical Convention. Host: MIT Model Rocket Society. Events: R&D contest, Plastic Model contest, Boost/Glide and Rocket Glider contests, Photo contest; discussion groups on R&D Techniques, Propulsion, Boost/Glide Construction, Plastic Modeling, and many other topics; demo launch, banquet and three other meals; manufacturer displays. Contact: Owen Knox, MITMRS, MIT Branch Post Office, Box 110, Cambridge, Mass. 02139.

April 19-22, 1973—Santa Barbara, California. EQUICON (Star Trek Convention). Steadily growing attendance (10,000 anticipated) may force move to Los Angeles, same dates. Contact: Cheryl Etchison, 5517½ Fernwood Ave., Hollywood, California 90028.

June 21-24, 1973—New Orleans, Louisiana. VUL-CON I (Star Trek Convention). At the Jung Hotel. Contact: VUL-CON I, P.O. Box 8087, New Orleans, Louisiana 70180.

June 29 -July 1, 1973—1973 Canadian Model Rocket Conference. Conference open to all model rocketeers in Canada and America. Events: Discussion groups, films, R&D, etc. Contact: Canadian Conference 1973, c/o ARRA, P.O. 1455 Place Bonaventure, Montreal 114, Quebec, Canada.

July 7, 1973—Seattle, Washington. Name: Boeing Management Assn. Meet. $1500 Scholarship Grand Prize (with *consideration* of an additional $500 for 2nd and 3rd place overall). Free housing for those traveling to Seattle from a great distance. Flown at NARAM-14 site. Aerospace events will be officiated by the South Seattle Rocket Society (there will also be model airplane-type events). Events will be announced at a later date.

FOREIGN CONTEST

June 16-17, 1973—Toronto, Canada. Name: Toronto Regional Rocket Meet No. 3 (TRRM-3). Open meet and seminars sponsored by the Canadian Rocket Society. Place: The Mini-Cape, Meadowvale Rd. and Sheppard Ave. East, Scarborough, Toronto. Competitions and presentation of the Annual Diamond Trophy for Model Rocketry. Science teachers and their students especially invited. Contact: Paul Reid, C.R.S., Adelaide St., P.O. Box 396, Toronto M5C 2J5, Canada.

(Soapbox continued from page 11)

In my opinion, modelers will be able to get revisions sooner and keep track of them more easily. We would be able to stick this new style Pink Book in the same loose-leaf notebook as the LAC *Section Manual* and NAR By-Laws and could bring them more handily to the field.

Eventually the NAR Technical Services could sell special colorful NAR styled notebooks entitled "Handbook of the NAR" to the membership.

This new Pink Book could be printed two-sided or one-sided so that a member would be able to type any minor revision himself on the blank side. I hope that the whole membership gives my suggestion some thought when printing time arrives.

ERRATA

The vertical scale of the left-hand graph in "The Effects of Delayed Staging on a Multi-Staged Model Rocket's Performance", page 8 in the January, 1973 *Model Rocketeer,* should run from zero to two-hundred forty, in steps of twenty, rather than from zero to twelve hundred.

How's the weather up there?

You can find out. Transmitters have been around for some time now. And Enerjet has the perfect booster — The Nike Ram. Gets your package up where it can really look around. The science fair season is coming. Most contests next year have competition in R & D too. Why fool around when you can do something really meaningful with your Model Rocket Talent. Think about it.

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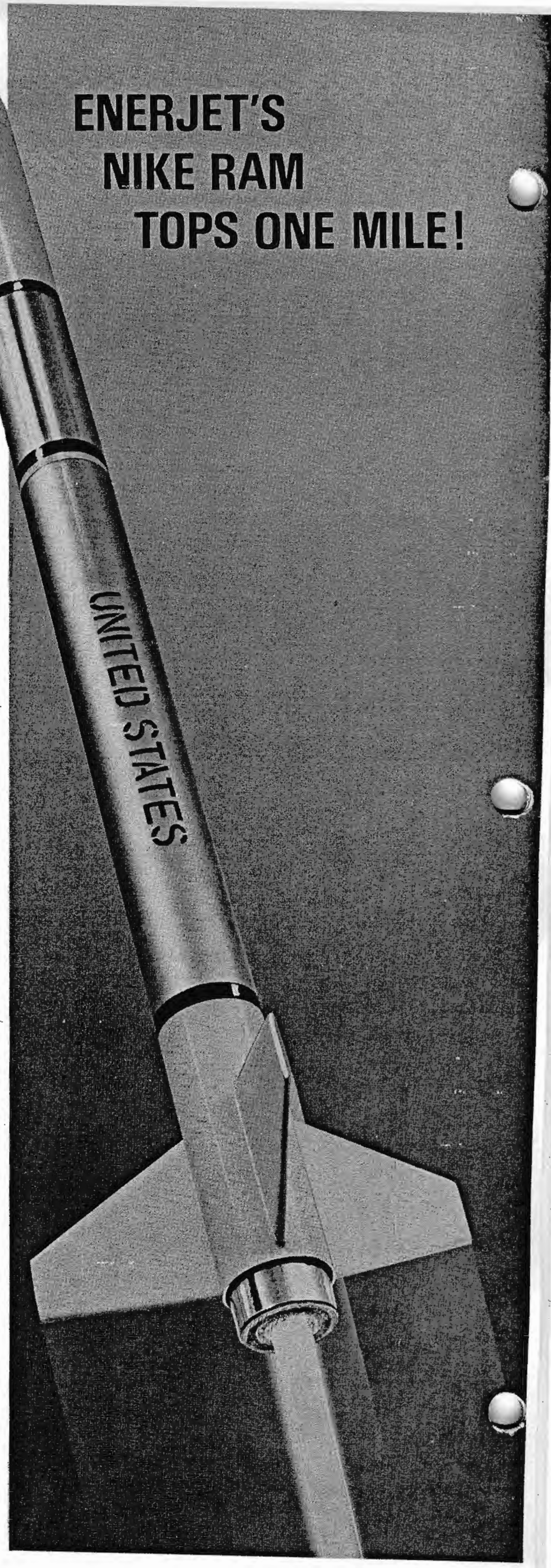

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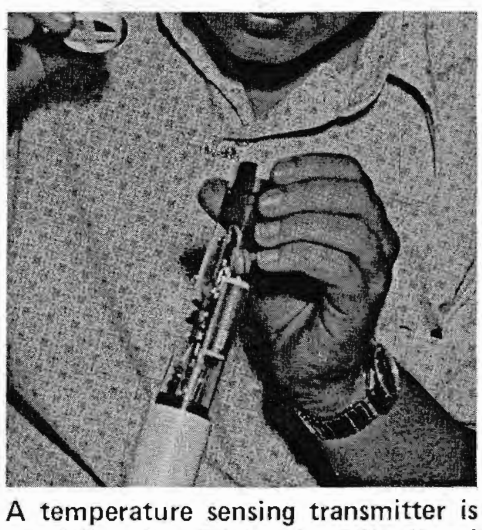

A temperature sensing transmitter is carefully placed into the Nike Ram's payload capsule.